컴퓨터 그래픽스 연구실

현재 관심 분야

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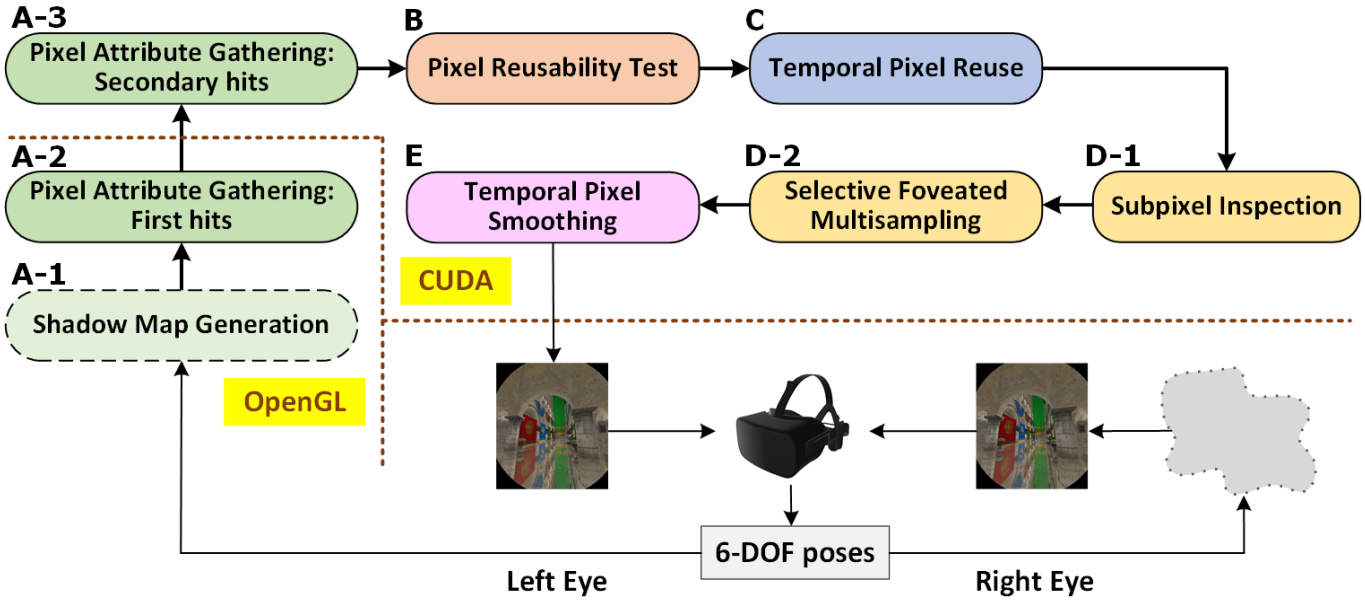
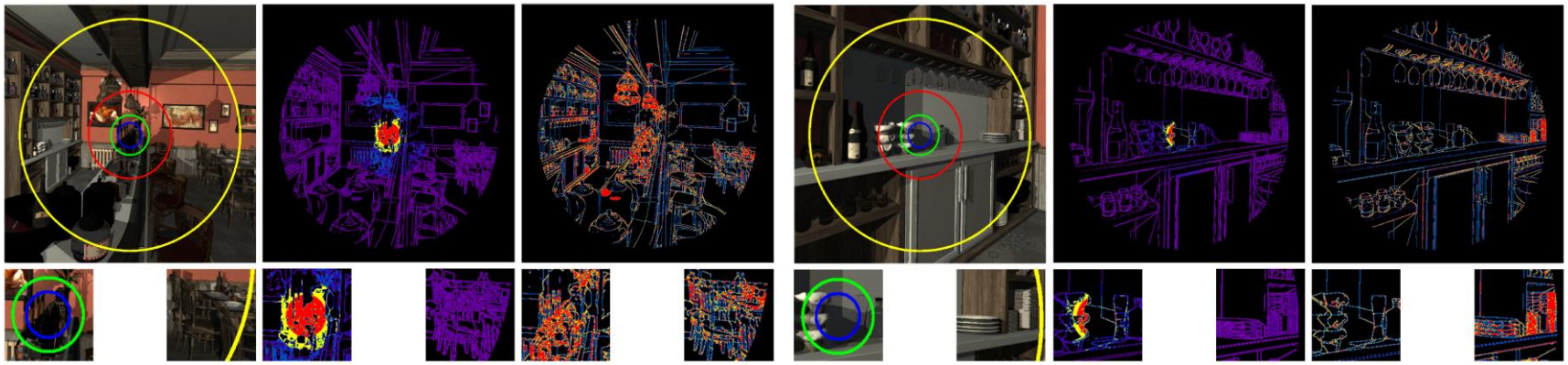
Real-time Ray Tracing for Head-mounted Displays

- HMD에 최적화된 ray tracing 기반의 real-time rendering 기술 개발
- 효과적인 ray tracing 기술 적용을 통한 가상 현실(VR)의 몰입감 증대
- GPU 가속 ray tracing 기술의 3D game 등 관련 분야로의 적용

  - **논문:** Y. Kim, Y. Ko, and I. Ihm, "Selective Foveated Ray Tracing for Head-Mounted Displays," 2021 IEEE International Symposium on Mixed and Augmented Reality (ISMAR), pp. 413-421, Bari, Italy, October 2021.
  - **과제:** I. Ihm (PI), Research on Immersive Extended-Reality Technologies Supporting Cooperation between Users from Different Realities, National Research Foundation of Korea, 2020/3/1 - 2024/2/29.





(a) Example 1 (b) Ours (c) Selective [8] (d) Example 2 (e) Ours (f) Selective [8]

Real-time Ray Tracing on Mobile Platform

- 제한된 성능을 가지는 스마트폰의 GPU 상에서의 적응적 샘플링을 통한 ray tracing 모듈의 성능 향상 알고리즘 제시
- 공간가속구조인 BVH(Bounding Volume Hierarchy)의 구축 및 탐색의 최적화 기술 개발

➢ **과제:** I. Ihm (PI), Adaptive Sampling for Ray Tracing in Resource-limited Mobile Graphic Environments, Samsung Electronics, 2024/4/1 - 2025/3/31.

FAIRY FOREST
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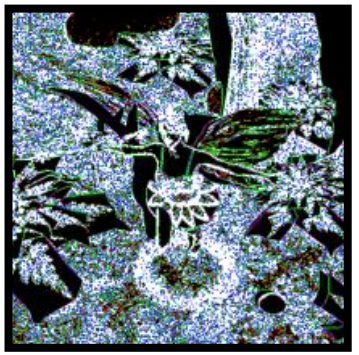
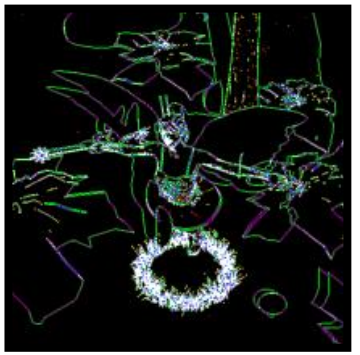


τ_α = 0.1

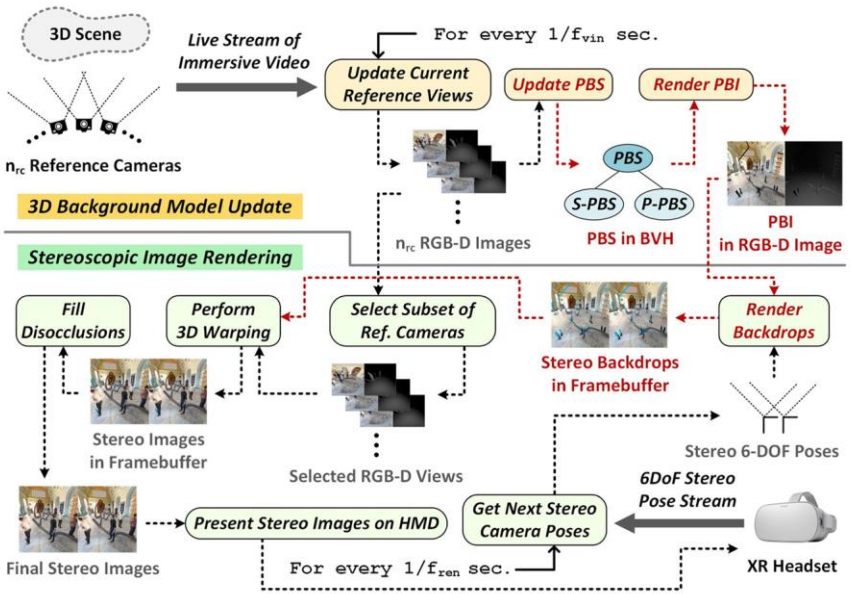


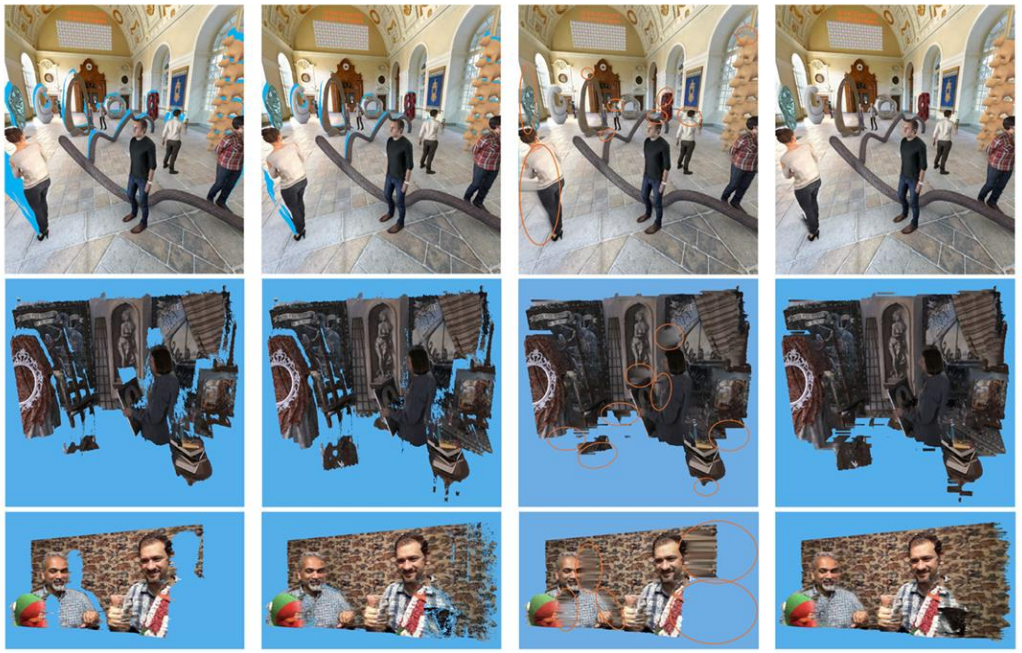
τ_α = 0.3

Real-time Stereoscopic Rendering of Immersive Video

- VR 환경에서 깊이 정보를 포함하는 MPEG immersive video(MIV)를 고속으로 가시화 해주는 다중 GPU 기반 렌더링 기술
- 연구실 개발 3D background model 기술을 사용하여 렌더링 화질 향상
- MIV의 3D 정보 기반의 3D 렌더링 기술 적용을 통한 가상 현실 환경의 확장

  - **논문:** Y. Kim, J. Yun, J. Yun, S. Kwak, I. Ihm, "Ray Tracing-based Construction of 3D Background Model for Real-time Stereoscopic Rendering of Live Immersive Video," Virtual Reality, Vol. 28, Article No. 17, January 2024.
  - **과제:** I. Ihm (PI), Research on Immersive Extended-Reality Technologies Supporting Cooperation between Users from Different Realities, National Research Foundation of Korea, 2020/3/1 - 2024/2/29.
  - **과제:** I. Ihm (PI), Multi-GPU-based Implementation of Optimized Software Module for Rendering MPEG Immersive Video(MIV), Electronics and Telecommunications Research Institute (ETRI), 2024/3/18 - 2024/11/30.





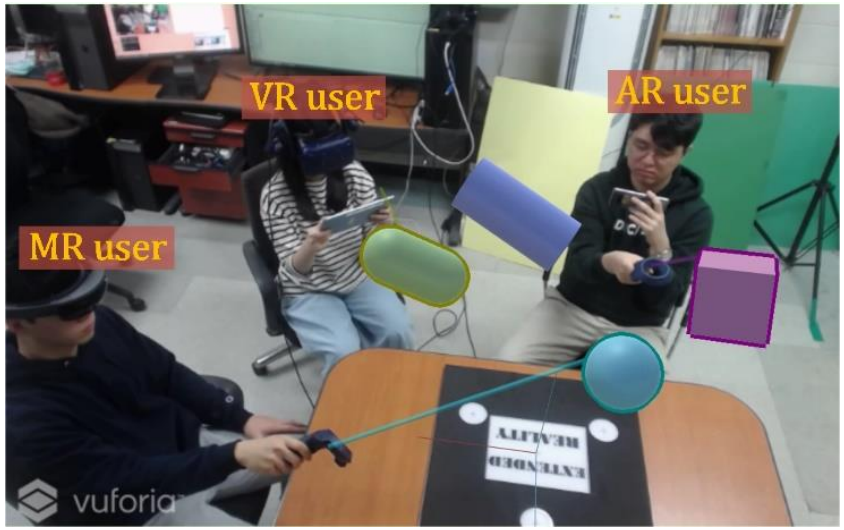
(a) 3D warping (no 3DBM) (b) 3D warping (ours) (c) Final rendering (no 3DBM) (d) Final rendering (ours)

Rendering without shadow + Shadow map = Rendering with shadow

Immersive Cooperative Work between Heterogeneous XR Users

- VR, AR, 그리고 MR 등 서로 다른 형태의 확장현실(XR, eXtended Reality) 사용자들이 하나의 XR 환경에 몰입하여 효과적인 협력 작업(cooperative work)을 할 수 있도록 해주는 요소 기술
- XR 세상 공간과 실제 현실 공간의 정밀한 공유 기술 개발

  - **논문:** J. An, G. Choi, W. Chun, Y. Joo, S. Park, I. Ihm, "Accurate and Stable Alignment of Virtual and Real Spaces Using Consumer-Grade Trackers," Virtual Reality, Vol. 26, Issue 1, pp. 125-141, March 2022.
  - **논문:** J. An, J. Lee, S. Park, I. Ihm, "Integrating Heterogeneous VR Systems into Physical Space for Collaborative Extended Reality," IEEE Access, Vol. 12, pp. 9848-9859, January 2024.
  - **과제:** I. Ihm (PI), Research on Immersive Extended-Reality Technologies Supporting Cooperation between Users from Different Realities, National Research Foundation of Korea, 2020/3/1 - 2024/2/29.



(a) Method 1: arithmetic average of time series data

(b) Method 4: ellipsoid-based approximation